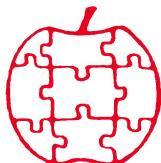


# Apple



# Assembly

# Line

\$1.80

Volume 6 -- Issue 12

September, 1986

### In This Issue...

Short Symbol Table Listing . . . . .	2
Minuteman 250 UPS. . . . .	8
Automatic Setup for ProDOS S-C Macro Assembler . . . . .	11
More on DOS 3.3 and BRUN . . . . .	12
Important Patch for ProDOS S-C Macro Assembler . . . . .	16
Patch Bob's ProDOS Selector for Videx. . . . .	19
MLI Calls and the Monitor "L" Command. . . . .	22
That Other Integer Square Root . . . . .	26
Thoughts on the ProDOS Bit Map . . . . .	28

### What About the New Apple //?

The cloud of rumors surrounding a new, improved, much more powerful Apple // machine is beginning to condense, but there is still no solid public information and no data coming out of Apple. The latest hints indicate that there will be a major announcement sometime this month, so we might all know the answers by the time you read these words.

There is one thing you can be certain of: As soon as we can come out with reliable and accurate details, Apple Assembly Line will be the place to read about how to explore and program this new successor to the computer that all of us have devoted so much to and gotten so much from.

Many of the people we talk to are anticipating an explosion of excitement much like the "good old days" of the original Apple II. They expect the unveiling of such accessible power to rekindle the spirit that drew many of us into computing in the first place: a new world to explore. We hope that's true, and we're going to do our part to help it happen.

A Short Symbol Table Listing for the  
ProDOS S-C Macro Assembler.....Harvey R. Brown

The symbol table printed by the S-C Macro Assembler for a long program can be 20 or 30 pages long. Since the assembler allows for labels up to 32 characters long, and values up to 8 hexadecimal digits long, it only prints one label and value per line. Local labels are printed seven to a line, but I am not usually interested in their values anyway. Many times I would like a nice compact listing of only the named labels.

I personally try to stick to relatively short label names, so there would normally be room for four columns of labels in a compact listing. If we say the line length is up to 79 characters (calling it 80 might produce double spacing), that leaves 18 characters per column. I hardly ever have any values which require more than four digits to print in hexadecimal. Allowing for at least one blank between columns, and for a dash between label name and value, that means I have room for names of up to 12 characters long.

I wrote a USR command for the ProDOS version of the S-C Macro Assembler. After it is installed, typing USR causes the named labels to be listed in four columns in alphabetical order. Typing USR2 causes them to be listed in the order of their definition, which for the sake of this discussion I am calling "numerical" order.

I analyzed several symbol tables in memory after different assemblies, and figured out most of the data. The symbol table begins at \$1000, with the symbols in the order of their definition in the source code. Each entry has a 2-byte pointer to the next entry beginning with the same letter in alphabetical order. Next is a 4-byte value, with the low byte first. Next is a key byte, which contains a flag bit for whether or not there are local labels under this label, and the length of the label name. Following the key byte there are from 1 to 32 ASCII characters for the label name. If there are any local labels, there are up to 100 pairs of bytes following the label name, terminated by a single \$00 byte. The first byte of each pair is the label number in binary + \$80. Since local labels are numbered from .0 to .99, the first byte of each pair can have \$80 through \$E3 in it. The second byte of each pair can have any value from \$00 through \$FF in it, and is the offset from the named label value.

The pointers at the beginning of each entry are chained alphabetically. There is a separate chain for each starting letter, A through Z. A table beginning at \$0132 holds the address of the first symbol for each letter of the alphabet. This makes it easy for my program to list the symbols in alphabetical order, without doing any sorting.

There are two main routines, SYM1 and SYM2, to handle the alphabetic and numeric order. DO.ITEM outputs the name and address for a symbol. NEXT.ITEM.A moves a pointer to the next entry in alphabetical order, while NEXT.ITEM.N does the same in "numerical" order.

S-C Macro Assembler Version 2.0.....DOS \$100, ProDOS \$100, both for \$120
Version 2.0 DOS Upgrade Kit for 1.0/1.1/1.2 owners.....\$20
ProDOS Upgrade Kit for Version 2.0 DOS owners.....\$30
Source Code of S-C Macro 2.0 (DOS only).....additional \$100
Full Screen Editor for S-C Macro (with complete source code).....\$49
S-C Cross Reference Utility.....without source code \$20, with source \$50
RAK-Ware DISASM.....without source code \$30, with source \$50
S-C Word Processor (with complete source code).....\$50
DPL8 Source and Object.....\$50
Double Precision Floating Point for Applesoft (with source code).....\$50
ES-CAPE (Extended S-C Applesoft Program Editor).....
Including Version 2.0 With Source Code.....\$50
ES-CAPE Version 2.0 and Source Code Update (for Registered Owners)....\$30
Bag of Tricks 2 (Quality Software).....(\$49.95) \$45 *
Copy II Plus (Central Point Software).....(\$39.95) \$35 *
Applesoft Toolbox Series (Roger Wagner Publishing)....each (\$39.95) \$36 *
all four (\$159.80) \$140 *
MacASM -- Macro Assembler for MacIntosh (Mainstay).....(\$150.00) \$100
S-C Documentor (complete commented source code of Applesoft ROMs).....\$50
Cross Assemblers for owners of S-C Macro Assembler.....\$32.50 to \$50 each
(Available: 6800/1/2, 6301, 6805, 6809, 68000, Z-80, Z-8, 8048, 8051, 8085, 1802/4/5, PDP-11, GI1650/70, others)

AAL Quarterly Disks.....each \$15, or any four for \$45  
Each disk contains the source code from three issues of AAL:

Jan-Mar., Apr-Jun., Jul-Sep., and Oct-Dec.

(All source code is formatted for S-C Macro Assembler. Other assemblers require some effort to convert file type and edit directives.)

Diskettes (with hub rings)..... package of 25 for \$25 \*  
 Vinyl disk pages, 6"x8.5", hold two disks each..... 10 for \$6 \*  
 Diskette Mailing Protectors (hold 1 or 2 disks)..... 40 cents each  
     (Cardboard folders designed to fit 6"X9" Envelopes.) or \$25 per 100 \*  
 Envelopes for Diskette Mailers..... 6 cents each

65802 Microprocessor (Western Design Center).....	(\$95)	\$50	*
quikLoader EPROM System (SCRG).....	(-\$179)	\$170	*
PROMGRAMER (SCRG).....	(-\$149.50)	\$140	*
Switch-a-Slot (SCRG).....	(-\$179.50)	\$170	*
Minuteman 250 Uninterruptible Power Supply.....	(-\$359)	\$350	+

"65816/65802 Assembly Language Programming", Fischer.....	(\$19.95)	\$18
"Programming the 65816", Eyes.....	(\$22.95)	\$21 *
"Apple //e Reference Manual", Apple Computer.....	(\$24.95)	\$23 *
"Apple //c Reference Manual", Apple Computer.....	(\$24.95)	\$23 *
"ProDOS Technical Reference Manual", Apple Computer.....	(\$29.95)	\$27 *
"Now That You Know Apple Assembly Language...", Gilder.....	(\$19.95)	\$18 *
"Apple ProDOS: Advanced Features for Programmers", Little..	(\$17.95)	\$17 *
"Inside the Apple //c", Little.....	(\$19.95)	\$18 *
"Inside the Apple //e", Little.....	(\$19.95)	\$18 *
"Apple II+/IIe Troubleshooting & Repair Guide", Brenner.....	(\$19.95)	\$18 *
"Apple ][ Circuit Description", Gayler.....	(\$22.95)	\$21 *
"Understanding the Apple II", Sather.....	(\$22.95)	\$21 *
"Understanding the Apple //e", Sather.....	(\$24.95)	\$23 *
"Enhancing Your Apple II, vol. 1", Lancaster.....	(\$15.95)	\$15 *
"Enhancing Your Apple II, vol. 2", Lancaster.....	(\$17.95)	\$17 *
"Assembly Cookbook for the Apple II/IIe", Lancaster.....	(\$21.95)	\$20 *
"Beneath Apple DOS", Worth & Lechner.....	(\$19.95)	\$18 *
"Beneath Apple ProDOS", Worth & Lechner.....	(\$19.95)	\$18 *
"Real Time Programming -- Neglected Topics", Foster.....	(\$9.95)	\$9 *
"Microcomputer Graphics", Myers.....	(\$14.95)	\$14 *
"Assem. Language for Applesoft Programmers", Finley & Myers.	(\$18.95)	\$18 *
"Assembly Lines -- the Book", Wagner.....	(\$19.95)	\$18 *
"AppleVisions", Bishop & Grossberger.....	(\$39.95)	\$36 *

\* On these items add \$2.00 for the first item and  
\$.75 for each additional item for US shipping.

+ Inquire for shipping cost.

Foreign customers inquire for postage needed.

Texas residents please add 6 1/8 % sales tax to all orders.

\*\*\* S-C SOFTWARE, P. O. BOX 280300, Dallas, TX 75228 \*\*\*  
\*\*\* (214) 324-2050 \*\*\*  
\*\*\* Master Card, VISA, Discover and American Express \*\*\*

I chose \$7400 as the origin. The area from \$7400 through \$77FF is only used by the EXEC command in the ProDOS S-C Macro Assembler. When you assemble the program, the object code will be automatically written on the binary file B.SHORTSYM (because of the .TF directive in line 1030). Thereafter, you can install the USR and USR2 commands by typing "-B.SHORTSYM". It will remain installed until you use the EXEC command or leave the assembler system.

[ It turns out to be quite easy to adapt Harvey's fine program for the DOS version of the assembler. You just need to make the following changes or additions:

```

1020          .OR $800      or whatever
1200 LOMEM     .EQ $4A,4B
1220 USR.VECTOR .EQ $D006

1381          LDA $C083
1382          LDA $C083
1421          LDA $C080

```

And that's all there is to it! Thanks, Harvey. Bill M. ]

```

1000 *SAVE S.SHORTSYM
1010 *
7400- 1020 ----- .OR $7400
1030           .TF B.SHORTSYM
1040 *
1050 * SHORTSYM by Harvey R. Brown
1060 *             August 3, 1986
1070 *
04- 1080 NO.COLUMNS .EQ 4
4F- 1090 LINE.LENGTH .EQ 79
1100 *
00- 1110 PTR       .EQ 0,1
02- 1120 ALPH.INDEX .EQ 2
03- 1130 NONZERO   .EQ 3
04- 1140 HORIZ     .EQ 4
05- 1150 KEY        .EQ 5
06- 1160 LENGTH     .EQ 6
07- 1170 YSAVE      .EQ 7
1180 *
CC- 1190 END.TABLE .EQ $CC,CD
67- 1200 LOMEM      .EQ $67,68 WARNING: PRODOS VERSION ONLY
1210
8006- 1220 USR.VECTOR .EQ $8006 WARNING: PRODOS VERSION ONLY
1230 *
0200- 1240 IN         .EQ $200
0132- 1250 ALPHTABLE .EQ $132    ADDRESSES FOR 1ST ENTRY A,B,..
1260 *
C000- 1270 KEYBD     .EQ $C000
C010- 1280 STROBE     .EQ $C010
1290 *
F941- 1300 PRNTAX    .EQ $F941
F94A- 1310 PRBL2     .EQ $F94A
FDOC- 1320 RDKEY     .EQ $FDOC
FD8E- 1330 CROUT     .EQ $FD8E
FDDA- 1340 PRBYTE    .EQ $FDDA
FDED- 1350 COUT      .EQ $FDED
1360 *
1370 *-- BRUN OR "--" COMES HERE --
1380 SET.UP.USR.VECTOR
7400- A9 0B 1390 LDA #USR.PROCESSOR   SET UP USR VECTOR
7402- 8D 07 80 1400 STA USR.VECTOR+1
7405- A9 74 1410 LDA /USR.PROCESSOR
7407- 8D 08 80 1420 STA USR.VECTOR+2
740A- 60 1430 RTS
1440 *

```

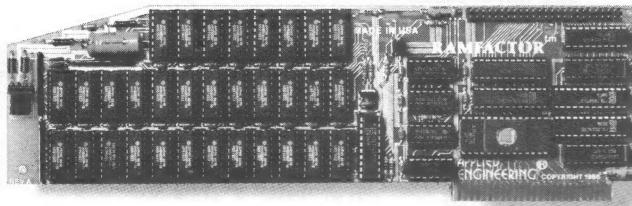
1450 \*--- "USR or USR2 comes here ----  
 1460 USR.PROCESSOR  
 740B- A0 00 1470 LDY #0  
 740D- 84 04 1480 STY HORIZ 0 HORIZ POSITION  
 740F- C8 .1 1490 INY CHECK INPUT BUFFER FOR OPTION  
 7410- B9 00 02 1500 LDA IN,Y  
 7413- F0 07 1510 BEQ SYM1 =\$00 is CR (NO OPTION); USE ALPH.  
 7415- C9 32 1520 CMP #'2'  
 7417- D0 F6 1530 BNE .1 OPTION 2 IS SYM2  
 7419- 4C 45 74 1540 JMP SYM2  
 1550 \*-----  
 1560 \*\*--SYM1 - ALPH. ORDER -----  
 1570  
 741C- A9 00 1580 SYM1 LDA #0 SET INDEX TO LETTER A  
 741E- 85 02 1590 STA ALPH.INDEX  
 7420- A6 02 1600 .1 LDX ALPH.INDEX GET ADDR OF 1ST ITEM  
 7422- BD 32 01 1610 LDA ALPHTABLE,X OF THIS STARTING LETTER  
 7425- 85 00 1620 STA PTR FROM S-C ASM TABLE  
 7427- E8 1630 INX  
 7428- BD 32 01 1640 LDA ALPHTABLE,X HIGH BYTE  
 742B- 08 1650 PHP  
 742C- 85 01 1660 STA PTR+1  
 742E- E8 1670 INX  
 742F- 86 02 1680 STX ALPH.INDEX READY FOR NEXT  
 7431- 28 1690 PLP  
 7432- F0 08 1700 BEQ .3 SKIP IF NO ITEMS THIS LETTER  
 7434- 20 60 74 1710 .2 JSR DO.ITEM PRINT NAME & ADDRESS  
 7437- 20 E3 74 1720 JSR NEXT.ITEM.A  
 743A- D0 FB 1730 BNE .2 FOR EACH ITEM, THIS LETTER  
 743C- A6 02 1740 LDX ALPH.INDEX  
 743E- E0 32 1750 CPX #50  
 7440- 90 DE 1760 BCC .1 LOOP 'TILL DONE Z  
 7442- 4C 8E FD 1770 JMP CROUT PRINT LAST LINE IN PRINTER  
 1780 \*-----  
 1790 \*\*-- SYM2 - NUMERICAL ORDER -----  
 1800  
 7445- A5 68 1810 SYM2 LDA LOMEM+1 POINT TO START OF TABLE  
 7447- 85 01 1820 STA PTR+1  
 7449- A5 67 1830 LDA LOMEM  
 744B- 85 00 1840 STA PTR  
 744D- 20 60 74 1850 .1 JSR DO.ITEM PRINT NAME & ADDRESS  
 7450- 20 F1 74 1860 JSR NEXT.ITEM.N  
 7453- A5 00 1870 LDA PTR CHECK FOR END  
 7455- C5 CC 1880 CMP END.TABLE  
 7457- A5 01 1890 LDA PTR+1  
 7459- E5 CD 1900 SBC END.TABLE+1  
 745B- 90 F0 1910 BCC .1 LOOP TILL END OF TABLE  
 745D- 4C 8E FD 1920 JMP CROUT  
 1930 \*-----  
 1940 \*\*-- DO.ITEM -----  
 1950  
 7460- A0 06 1960 DO.ITEM LDY #6 GET KEY  
 7462- B1 00 1970 LDA (PTR),Y  
 1980 \*-----  
 7464- 29 3F 1990 PRINT NAME AND #\$00111111 LOW 6-BITS IS LENGTH  
 7466- 85 06 2000 STA LENGTH  
 7468- C8 2010 .0 INY  
 7469- B1 00 2020 LDA (PTR),Y GET CHAR FROM NAME  
 746B- 09 80 2030 ORA #\$80 HI BIT ON  
 746D- 20 D9 74 2040 JSR PRCHAR PRINT IT  
 7470- C6 06 2050 DEC LENGTH  
 7472- D0 F4 2060 BNE .0 LOOP TO END OF NAME  
 7474- A9 AD 2070 LDA #".."  
 7476- 20 D9 74 2080 JSR PRCHAR  
 2090 \*-----  
 7479- A9 00 2100 PRINT ADDRESS LDA #0 NOTE:32 BITS  
 747B- 85 03 2110 STA NONZERO USE THIS TO OMIT LEADING 0'S  
 747D- A0 05 2120 LDY #5  
 747F- 84 07 2130 STY YSAVE  
 7481- B1 00 2140 .1 LDA (PTR),Y GET BYTE OF ADDRESS, HIGH FIRST  
 7483- D0 04 2150 BNE .2  
 7485- A5 03 2160 LDA NONZERO SKIP LEADING 0  
 7487- F0 09 2170 BEQ .3  
 7489- 20 DA FD 2180 .2 JSR PRBYTE PRINT BYTE  
 748C- E6 04 2190 INC HORIZ  
 748E- E6 04 2200 INC HORIZ  
 7490- E6 03 2210 INC NONZERO  
 7492- C6 07 2220 .3 DEC YSAVE  
 7494- A4 07 2230 LDY YSAVE NEXT BYTE LOWER

# RamFactor™

*All the Performance, Speed, and Software Compatibility of RamWorks™ in a Slot 1 through 7 Card.*

**T**hat's right! Now Applied Engineering offers you a choice. While RamWorks is the clear winner for the auxiliary slot in a IIe, RamFactor is the standard for slots 1 through 7. Now anyone with an Apple II+, Franklin, or Apple Ile preferring to use slots 1 through 7 can now enjoy the speed and performance that until now was only available with RamWorks.

With RamFactor, you'll be able to instantly add another 256K, 512K, or a full 1 meg on the main board and up to 16 meg with additional piggyback card. And since virtually all software is automatically compatible with RamFactor, you'll immediately be able to load programs into RamFactor for instantaneous access to information. You'll also be able to store more data for larger word processing documents, bigger data bases, and expanded spreadsheets.



## Very Compatible

All the leading software is already compatible with RamFactor. Programs like AppleWorks, Pinpoint, BPI, Managing Your Money, Dollars and Sense, SuperCalc 3A, PFS, MouseWrite, MouseDesk, MouseCalc, Sensible Speller, Applewriter Ile, Business Works, ReportWorks, Catalyst 3.0 and more. And RamFactor is fully ProDOS, DOS 3.3, Pascal 1.3 and CP/M compatible. In fact, no other memory card (RamWorks excepted) is more compatible with commercial software.

## AppleWorks Power

There are other slot 1-7 cards that give AppleWorks a larger desktop, but that's the end of their story. But RamFactor is the only slot 1-7 card that increases AppleWorks internal memory limits, increasing the maximum number of records in the database and lines permitted in the word processor, and RamFactor is the only standard slot card that will automatically load AppleWorks into RAM dramatically increasing speed and eliminating the time required to access the program disk, it will even display the time and date on the AppleWorks screen with any ProDOS clock. RamFactor will automatically segment large files so they can be saved on 5 1/4", 3 1/2", and hard disks. All this performance is available to anyone with an Apple Ile or II+ with an 80

column card. RamFactor, no other standard slot card comes close to enhancing AppleWorks so much.

## True 65C816 16 Bit Power

RamFactor has a built-in 65C816 CPU port for direct connection to our Ile 65C816 card for linearly addressing up to 16 meg for the most powerful 16 bit applications (II+ 65C816 card under development).

## Powerful Program Switcher

With RamFactor, you can organize memory into multiple work areas and switch between them. Each work area can contain different programs and even different operating systems. Now you can switch from one program to another or even switch from AppleWorks to DOS 3.3 to CP/M to Pascal to ProDOS in under a second. And with our Battery back-up option, you can have permanent storage for up to 20 years.

## Quality and Support of the Industry Leader

RamFactor is from Applied Engineering, the largest, most well supported manufacturer of Apple peripherals and the inventor of large RAM cards for the Apple. With our 5 year no hassle warranty and outstanding technical support, you're assured of the most trouble free product you can buy.

## Features:

- Up to 16 meg total memory, 256K to 1 meg on main board. Up to 16 meg with additional memory on piggyback card
- Fully Apple II Memory Expansion compatible
- Compatible with Apple Ile, II+ and Franklin
- Battery back-up option allows you to turn on your Apple and run your favorite programs in less than 1 second!
- Automatically recognized by ProDOS, DOS 3.3, Pascal and CP/M
- Built-in RamDrive™ software (a true RAM disk not disk caching)
- Systems are directly bootable from RamFactor if desired
- Built-in linear addressing 16 bit co-processor port
- Built-in self diagnostic software
- Automatic expansion with AppleWorks 1.3 or later
- Allows Apple II+ and Ile to run your AppleWorks without buying additional software
- Accelerates AppleWorks
- Displays time and date on the AppleWorks screen with any ProDOS clock
- Fits any I/O slot except slot 3
- Fully socketed and user upgradeable
- Much, much more

RamFactor with 256K	\$239
RamFactor with 512K	\$289
RamFactor with 1 MEG	\$389
RamFactor with 2-16 MEG	CALL
Battery Back-up Option	\$179
65C816 16 Bit Card	\$159

Order RamFactor today . . . with 15 day money back guarantee and our "no hassle" five year warranty. Call 9 a.m. to 11 p.m., 7 days, or send check or money order to Applied Engineering, MasterCard, Visa and C.O.D. welcome. Texas residents add 5% sales tax. Add \$10.00 if outside USA.

**A** Applied Engineering™  
The Apple enhancement experts.

(214) 241-6060

P.O. Box 798, Carrollton, TX 75006

7496-	C0	03	2240	CPY #3	
7498-	BO	E7	2250	BCS .1	
749A-	B1	00	2260	LDA (PTR),Y    ALWAYS DO LOWEST BYTE	
749C-	20	DA	FD	JSR PRBYTE	
749F-	E6	04	2270	INC HORIZ	
74A1-	E6	04	2280	INC HORIZ	
			2290		
			2300	----- TAB -----	
74A3-	A2	03	2310	LDX #NO.COLUMNS-1	
74A5-	18		2320	CLC	
74A6-	A9	00	2330	LDA #0	
74A8-	69	13	2340	.4    ADC #LINE.LENGTH/NO.COLUMNS	
74AA-	C5	04	2350	CMP HORIZ	
74AC-	F0	02	2360	BEQ .45	
74AE-	BO	OC	2370	BCS .5    FOUND	
74B0-	CA		2380	.45    DEX	
74B1-	DO	F5	2390	BNE .4    TRY NEXT TAB	
74B3-	20	8E	FD	JSR CROUT    MOVE ON TO NEXT LINE	
74B6-	A9	00	2400	LDA #0	
74B8-	85	04	2410	STA HORIZ	
74BA-	F0	OB	2420	BEQ .6    ...ALWAYS	
74BC-	48		2430	PHA    SPACE TO NEXT TAB	
74BD-	38		2440	.5    SEC	
74BE-	E5	04	2450	SBC HORIZ	
74CO-	AA		2460	TAX	
74C1-	20	4A	F9	JSR PRBL2	
74C4-	68		2480	PLA	
74C5-	85	04	2500	STA HORIZ	
			2510	----- STOP/START/QUIT -----	
74C7-	AD	00	CO	2520	.6    LDA KEYBD    STOP UPON KEYPRESS
74CA-	10	OC		2530	BPL .7
74CC-	8D	10	CO	2540	STA STROBE
74CF-	20	OC	FD	2550	JSR RDKEY    WAIT FOR 2ND KEYPRESS
74D2-	C9	8D		2560	CMP #\$8D
74D4-	DO	02		2570	BNE .7
74D6-	68			2580	PLA    EXIT ON RETURN
74D7-	68			2590	PLA
74D8-	60			2600	.7    RTS
			2610	----- PRCHAR -----	
74D9-	84	07		2620	PRCHAR    STY YSAVE
74DB-	20	ED	FD	2630	JSR COUT
74DE-	E6	04		2640	INC HORIZ
74EO-	A4	07		2650	LDY YSAVE
74E2-	60			2660	RTS
			2670	----- NEXT.ITEM.A -----	
74E3-	A0	01		2680	NEXT.ITEM.A    LDY #1    GET ADDR OF NEXT ITEM FROM THIS ONE
74E5-	B1	00		2690	LDA (PTR),Y    (LEFT BY S-C ASM)
74E7-	48			2700	PHA
74E8-	88			2710	DEY
74E9-	B1	00		2720	LDA (PTR),Y    AND LOW
74EB-	85	00		2730	STA PTR
74ED-	68			2740	PLA
74EE-	85	01		2750	STA PTR+1
74F0-	60			2760	RTS
			2770	----- NEXT.ITEM.N -----	
74F1-	A0	06		2780	NEXT.ITEM.N    LDY #6    GET KEY FROM THIS ITEM
74F3-	B1	00		2790	LDA (PTR),Y    SAVE +/- STATUS
74F5-	08			2800	PHP    AND #\$00111111    GET LENGTH OF SYMBOL
74F6-	29	3F		2810	CLC
74F8-	18			2820	ADC #6
74F9-	69	06		2830	TAY
74FB-	A8			2840	PLP
74FC-	28			2850	BPL .2    SKIP IF NO LOCAL LABELS
74FD-	10	08		2860	INY
74FF-	C8		.1	2870	LDA (PTR),Y
7500-	B1	00		2880	BEQ .2
7502-	F0	03		2890	INY
7504-	C8			2900	BNE .1    ...ALWAYS
7505-	DO	F8		2910	-----
			2920	TYA	
			2930	SEC	
7507-	98			2940	ADC PTR
7508-	38			2950	STA PTR
7509-	65	00		2960	BCC .4
750B-	85	00		2970	INC PTR+1
750D-	90	02		2980	
750F-	E6	01		2990	
7511-	60			3000	
			3010	.4    RTS	

## Minuteman 250 UPS

For years I have been wanting an uninterruptible power supply. Now with a Sider and a large RAMWORKS card, it is almost an imperative. A short interruption of power could easily destroy a full day's work or more. If it occurred while I am writing on the Sider or even on a floppy, it could result in a lot more damage. Other power problems, like spikes which occur during thunderstorms, can cause physical damage to the power supplies in the Apple or its peripherals. I might be able to blame the recent \$177 replacement of my Sider power supply on just such a storm.

The reason I haven't bought a UPS before now is the price. Almost all of them are over \$500. At last I have found one with most of the features I want, for only \$359.

The Minuteman 250, from Para Systems (a local Dallas company), is just right for an Apple II system. It may be right for yours as well. If so, we will send you one for \$350 plus freight. Normal freight inside the USA should be under \$10. Para Systems makes a full line of UPS products, up to 1000 watts. The Minuteman 250 is rated at 250 watts, and is more than adequate for an Apple II system.

The unit is about an inch larger than a standard Disk II drive in each dimension (it fits nicely under the drive on my system), and weighs 19 pounds. It is heavy for its size, because there is a lot inside: sealed maintenance-free 12-volt battery, inverter and charger electronics, line surge protection, and so on. Normally, power from the AC-line passes through a 3-stage EMI/RFI filter and surge protector directly to your equipment. When the AC-power drops below 95 volts, a battery-powered inverter takes over within four milliseconds. The inverter output is a stepped rectangular wave form, which approximates a sine wave. (Pure sine-wave output costs a lot more, and is not necessary for any equipment I am using.)

There are two outlets, so I plugged my Sider into one and my Apple //e into the other. Usually I have a fan on the side of my //e, from RH Electronics or Kensington Microware. The fan unit plugs into the Minuteman UPS, and powers the Apple //e, an Apple monochrome monitor, and a dot matrix printer. The printer is rated about 60 watts, Sider about 40 watts, monitor about 30 watts, and Apple about 60 watts. That is a total of 190 watts, if the printer is running, or 130 when it is not running. Minuteman can handle a 250-watt load, and maintain full operation for five minutes after the AC input power goes away. If I am not printing, it should maintain full operation of everything else for 15 minutes. That is plenty of time to back up whatever I am working on and turn off the system.

There are a few disadvantages. When AC input power goes away, there is an audible alarm. The alarm is a continuous tone, sounding for the entire time that the AC is off and the battery is powering the system. When the battery has two minutes of charge remaining, the alarm changes to a beep-beep-beep sound. There is no way to shut off the alarm until either AC power

comes back on, or you turn off your computer and the UPS. It gets very tiresome. I think there should be a way to either turn off the audible alarm, until the last two minutes of battery power, or at least change it to a short blip once per half-minute or so.

However, in the nine years I have been using Apples, I have not had a serious power outage while my computer was in use. Maybe as many as ten times in nine years there have been very short power outages, most as short as one or two seconds. There have been occasional annoying problems we have blamed on power glitches, spikes, or whatever. The Minuteman should take care of all of these.

The other disadvantage is that when you are leaving the system off and unattended for a long time, you are supposed to remember to turn off the Minuteman. If you leave it on, and AC power goes off for a long time, the battery could be damaged. I don't know how long power would have to be off to damage the battery, since the only power used would be that to run the inverter, but I am guessing it would be at least several hours. It seems to me that there should be a circuit built in to the Minuteman to detect the no-external-load condition, and shut itself off before battery damage could occur.

Even with these disadvantages, I heartily recommend the Minuteman 250. If it even saves me from ONE catastrophic situation, it could pay for itself. As I mentioned above, we will send you one for only \$350 plus freight.

## We Make Measurement And Control Easy!

### 12 BIT, 16 CHANNEL PROGRAMMABLE GAIN A/D

- All new 1984 design incorporates the latest in state-of-Art I.C. technologies.
- Complete 12 bit A/D converter, with an accuracy of 0.02%!
- 16 single ended channels (single ended means that your signals are measured against the Apple's C.N.D.) or 8 differential channels. Most all the signals you will measure are single ended.
- 9 software programmable full scale ranges, any of the 16 channels can have any range at any time. Under program control, you can select any of the following ranges:  $\pm 10\text{V}$ ,  $\pm 5\text{V}$ ,  $\pm 2.5\text{V}$ ,  $\pm 1.0\text{V}$ ,  $\pm 500\text{MV}$ ,  $\pm 250\text{MV}$ ,  $\pm 100\text{MV}$ ,  $\pm 50\text{MV}$ , or  $\pm 25\text{MV}$ .
- Very fast conversion (25 micro seconds).
- Analog input resistance greater than 1,000,000 ohms.
- Laser-trimmed scaling resistors.
- Low power consumption through the use of CMOS devices.
- The user connector has +12 and -12 volts on it so you can power your sensors.
- Only elementary programming is required to use the A/D.
- The entire system is on one standard size plug in card that fits nicely inside the Apple.
- System includes sample programs on disk.

### PRICE \$319

A few applications may include the monitoring of: ● flow ● temperature ● humidity ● wind speed ● wind direction ● light intensity ● pressure ● RPM ● soil moisture and many more.

Texas Residents Add 5% Sales Tax  
Add \$10.00 If Outside U.S.A.

### A/D & D/A

- A/D & D/A Features:
- Single PC card
- 8 channels A/D
- 8 channels D/A
- Fast conversion time
- Very easy programming
- Many analog ranges
- Manual contains sample applications

### A/D SPECIFICATIONS

- 0.3% accuracy
- On-board memory
- Fast conversion (.078 MS per channel)
- A/D process totally transparent to Apple (looks like memory)
- User programmable input ranges are  $0 \text{ to } 10\text{V}$ ,  $0 \text{ to } 5\text{V}$ ,  $0 \text{ to } 2.5\text{V}$ ,  $0 \text{ to } 1.0\text{V}$ ,  $0 \text{ to } 500\text{MV}$ ,  $0 \text{ to } 250\text{MV}$ ,  $0 \text{ to } 100\text{MV}$ ,  $0 \text{ to } 50\text{MV}$ , or  $0 \text{ to } 25\text{MV}$ .
- The A/D process takes place on a continuous, channel sequencing basis. Data is automatically transferred to its proper location in the on-board RAM. No A/D converter could be easier to use.

### D/A SPECIFICATIONS

- 0.3% accuracy
- On-board memory
- Digital output buffer amps can drive 4 Mhz
- D/A process is totally transparent to the Apple (just poke the data)
- Fast conversion (.003 MS per channel)
- User programmable output ranges are 0 to 5 volts and 0 to 10 volts

The D/A section contains 8 digital to analog converters which are fully buffered and all interface logic on a single card. On-card latches are provided for each of the eight D/A converters. No D/A converter could be easier to use. The on-board amplifiers are laser-trimmed during manufacture, thereby eliminating any requirement for off-set nulling.

### PRICE \$199

### SIGNAL CONDITIONER

Our 8 channel signal conditioner is designed for use with both our A/D converters. This board incorporates 8 F.E.T. op-amps, which allow almost any gain or offset. For example, an input signal that varies from 2.00 to 2.15 volts, or a signal that varies from 0 to 50 mV can easily be converted to 0-10V output for the A/D.

The signal conditioner's outputs are on a high quality 16 pin gold I.C. socket that matches the one on the A/D's so a simple ribbon cable connects the two. The signal conditioner can be powered by your Apple or from an external supply.

### FEATURES

- 4.5" square for standard card cage and 4 mounting holes for standard mounting. The signal conditioner does not plug into the Apple, it can be located up to  $\frac{1}{2}$  mile away from the A/D.
- 22 pin 156 spacing edge card input connector (extra connectors are easily available i.e. Radio Shack).
- Large bread board area.
- Full detailed schematic included.

### PRICE \$79

### I/O 32

- Provides 4, 8-Bit programmable I/O Ports
- Any of the 4 ports can be programmed as an input or an output port
- All I/O lines are TTL (0-5 volt) compatible
- Your inputs can be anything from high speed logic to simple switches
- Programming is made very easy by powerful on-board firmware
- The I/O 32 is your best choice for any control application

The I/O manual includes many programs for inputs and outputs.

Some applications include:

Burglar alarm, direction sensing, use with relays to turn on lights, sound buzzers, start motors, control tape recorders and printers, use with digital joystick.

### PRICE \$89

Please see our other full page ad in this magazine for information on Applied Engineering's Timermaster Clock Card and other products for the Apple. Our boards are far superior to most of the consumer electronics made today. All I.C.'s are in high quality sockets with mil-spec. components used throughout. P.C. boards are glass-epoxy with gold contacts. Made in America to be the best in the world. All products compatible with Apple II and IIe.

Applied Engineering's products are fully tested with complete documentation and available for immediate delivery. All products are guaranteed with a no hassle three year warranty.

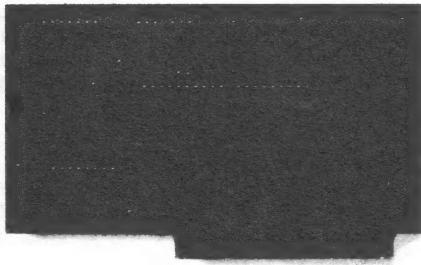
Call (210)241-6060

9 a.m. to 11 p.m. 7 days a week

MasterCard, Visa & C.O.D. Welcome

No extra charge for credit cards

# With Z-80 Plus, run CP/M®—the largest body of software in existence.



*Now, get two computers in one,  
and all the advantages of both.*

Enter the CP/M world with the new Z-80 Plus card from Applied Engineering, and introduce your Apple IIe® or II+® to the thousands of CP/M programs. Only the Z-80 Plus comes standard with the new 4.0 software, the most advanced system ever for running CP/M programs.

The new 4.0 boasts advanced features like built-in disk emulation for popular memory expansion boards, boosting both system speed and storage capacity. And menu-driven utilities that let you get to work faster. The Z-80 Plus also lets you run older CP/M programs — all the way down to Version 1.6 (2.2 is the most popular).

The Z-80 Plus is the only card on the market capable of accessing more than 64K in an Apple IIe. If you have an extended 80-column card, all 128K is usable, and if you have RamWorks, up to 1088K is available.

Each Z-80 Plus comes with our CP/M Ram Drive software, enabling IIe owners to use an extended 80-column card or a RamWorks card as a high-speed Ram disk which runs CP/M software up to *twenty times faster*. So packages like WordStar and dBASE II run at blinding speed.

Simply plug the Z-80 Plus into any slot in your Apple. You'll get the benefits of two computers in one — all at an unbelievably low price (only \$139!).

- Fully compatible with ALL CP/M software
- Fully compatible with most hard disks, including Corvus and the Sider
- Fully compatible with Microsoft disks (no pre-boot required)
- Specifically designed for high speed operation in the Apple IIe (runs just as fast in the Apple II+ and Franklin)
- Runs WordStar, dBASE II, Turbo Pascal, Fortran-80, Peachtree and ALL other CP/M software with *no pre-boot*
- Semi-custom I.C. and low parts count allows Z-80 Plus to fly through CP/M programs with extremely low power consumption (we use the Z-80B)
- Does **EVERYTHING** other Z-80 boards do, *plus* Z-80 interrupts
- Five year warranty

Call to order today, 9 a.m. to 11 p.m. seven days, or send check or money order to Applied Engineering. MasterCard, VISA and C.O.D. welcome. Texas residents add 5 1/2% sales tax. Add \$10.00 outside U.S.A.

**AE** Applied Engineering  
P.O. Box 798, Carrollton, TX 75006  
(214) 241-6060

## Automatic SETUP for ProDOS S-C Macro Assembler.....Bill Morgan

Several readers have asked how to automatically execute some file upon starting the ProDOS S-C Macro Assembler, perhaps the Full Screen Editor, perhaps a RAMdisk program, or maybe an EXEC file to install several features. What people want is something analogous to BASIC.SYSTEM's automatic "-STARTUP" feature.

We should be able to patch the assembler's installation code to issue a ProDOS command by stuffing the command into the input buffer, terminated with a Carriage Return, and then calling \$BE03 to execute the command. However, not all commands function properly under this approach. The problem here is that the "--" command doesn't work, and the BRUN command seems to depend on how the called program exits. Specifically, when I tried to install my RAMdisk by sending BRUN PRODRIVE the program ran OK, but then crashed into the monitor rather than starting the assembler. A "--" command seemed to be simply ignored. I did find that BRUN FSE to install the Full Screen Editor worked correctly.

The ProDOS books say that you cannot issue the "--" and EXEC commands this way under BASIC.SYSTEM, so I assumed that EXEC would also fail for the assembler. The first version of this article therefore talked only about installing FSE, and suggested carefully testing other programs. At the last minute I decided to actually test EXEC before printing this. IT WORKED!

So, all you have to do is add the following patch to the assembler's installation code and create a text file to issue the commands you want. Here's the SETUP file I use:

```
- PRODRIVE
BLOAD SCASM.SYSTEM,A$2000,TSYS
BSAVE /RAM/SCASM.SYSTEM,A$2000,TSYS,L17920
BLOAD BASIC.SYSTEM,A$2000,TSYS
BSAVE /RAM/BASIC.SYSTEM,A$2000,TSYS,L10240
BLOAD FILER
BSAVE /RAM/FILER,A$1000,L25600
```

If you want to try this technique with other programs, be sure to start out with a test disk in case of unpredictable results.

You can confirm the address of the SC.INIT routine by checking the JSR instruction at \$8000 when the assembler is running. In the assembler's installation routine, \$206A is the address of the JMP \$8000 instruction that actually starts the assembler.

To install this into the assembler, first boot into the ProDOS S-C Macro Assembler, then do these steps:

```
:LOAD S.STARTER
:BLOAD SCASM.SYSTEM,A$2000,TSYS
:ASM
:BSAVE SCASM.SYSTEM,A$2000,L17920
```

If the file length of the assembler is different in the catalog of your disk, use that length in the L parameter.

```

1000 *SAVE S.STARTER
1010 -----
0200- 1020 WBUF .EQ $200
1030
830F- 1040 SC.INIT .EQ $830F
BE03- 1050 DOSCMD .EQ $BE03
1060 -----
1070 .OR $206A
206A- 4C B0 21 1080 JMP STARTER
1090
1100 .OR $21B0
1110 STARTER 1120 JSR SC.INIT get assembler ready
21B3- A2 00 1130 LDX #0
21B5- BD C6 21 1140 .1 LDA COMMAND,X
21B8- F0 06 1150 BEQ .2
21BA- 9D 00 02 1160 STA WBUF,X stuff command into buffer
21BD- E8 1170 INX
21BE- D0 F5 1180 BNE .1 always
1190
21C0- 20 03 BE 1200 .2 JSR DOSCMD do it!
21C3- 4C 03 80 1210 JMP $8003 just in case
1220 -----
21C6- C5 D8 C5
21C9- C3 A0 D3
21CC- C5 D4 D5
21CF- D0 1230 COMMAND .AS -/EXEC SETUP/
21D0- 8D 00 1240 .HS 8D00

```

### More on DOS 3.3 and BRUN.....Louis Pitz

In the June 1986 issue of AAL Bob tried to give the final word on the problem of using BRUN to execute machine language programs which themselves issue DOS commands. His last example, on page 12, still falls short of a complete solution. By adding some code I found in "Beneath Apple DOS", page 6-17, the solution can be complete. The following code can be BRUN either from the keyboard or from within an Applesoft program:

```

1000 .OR $300
1010 .TF B.SHOW.OFF
1020 -----
1030 PIZT.VERSION
0300- AD 59 AA 1040 LDA $AA59 SAVE DOS STACK POINTER
0303- 48 1050 PHA ON THE STACK
1060 -----
0304- A0 00 1070 LDY #0
0306- B9 29 03 1080 .1 LDA MSG,Y ISSUE DOS CATALOG COMMAND
0309- 20 ED FD 1090 JSR $FD8D
030C- C8 1100 INY
030D- C0 0A 1110 CPY #MSGSZ
030F- D0 F5 1120 BNE .1
1130 -----
0311- A9 00 1140 LDA #0 EQUIVALENT TO "NOMON C"
0313- 8D 5E AA 1150 STA $AA5E
0316- 68 1160 PLA RESTORE DOS STACK POINTER
0317- 8D 59 AA 1170 STA $AA59
1180 -----
031A- A4 76 1190 LDY $76 MSB OF APPLESOFT LINE NUMBER
031C- C8 1200 INY IF WAS $FF, MAKE $00
031D- F0 07 1210 BEQ .2 ...NOT IN APPLESOFT RUN MODE
031F- A4 33 1220 LDY $33 PROMPT CHARACTER
0321- C0 DD 1230 CPY "#]>" IS IT THE APPLESOFT PROMPT?
0323- F0 01 1240 BEQ .2 ...YES, SO NOT IN RUN MODE
0325- 60 1250 RTS PROGRAM RUNNING, EXIT WITH "RTS"
0326- 4C D0 03 1260 .2 JMP $3D0 NOT RUNNING, EXIT THE OTHER WAY
1270 -----
0329- 8D 84 1280 MSG .HS 8D.84 <RETURN>, CTRL-D
032B- C3 C1 D4
032E- C1 CC CF
0331- C7 1290 .AS -/CATALOG/
0332- 8D 1300 .HS 8D
0A- 1310 MSGSZ .EQ #-MSG
1320 -----

```

# **Save Time Debugging Your Assembly Language Programs With QUICK TRACY**

Now you can whiz out your assembly language programs even faster than before with **QUICK TRACY**. This new debugger was "just the thing Bill needed while working on the UniDisk boot program", in the July 1986 issue of Apple Assembly Line. **QUICK TRACY** will rapidly trace through your machine language object code, suggesting the execution of JSR instructions in real-time. Even though **QUICK TRACY** suggests, you are in complete control at all times. **QUICK TRACY** extends the S-C Macro Assembler by providing you with 27 powerful debugging commands. Whether you have the DOS 3.3 version or the ProDOS version, **QUICK TRACY** can do the job for you. Whether you have an Apple //e or Apple ][+ in 40 or 80 columns, **QUICK TRACY** can do the job for you. **QUICK TRACY** can execute those parts of your program at real-time that you know are okay, while carefully tracing and displaying all registers and flags for each instruction in those areas of your program that you designate. **QUICK TRACY** has 13 independent conditional breakpoints that you may set to SPELL OUT TROUBLE. One major advantage is that **QUICK TRACY** is located in memory with the S-C Macro Assembler; so as soon as you finish assembling your program, it is ready for **QUICK TRACY** to help you find the bugs. Let's face it. Even the very best programmers get bugs, and they have debuggers for their hardware. Now here is one specifically designed for your hardware and software needs.

Why are you wasting your valuable time debugging when you could have **QUICK TRACY** doing that tedious work for you?

**QUICK TRACY** is available in either **DOS** or **ProDOS** for only \$35.00  
(or both versions for only \$55.00).

**T'n'T SOFTWARE**  
624 Charmain Drive  
Campbell, CA 95008  
(408) 378-8358

We Accept Visa or MasterCard.

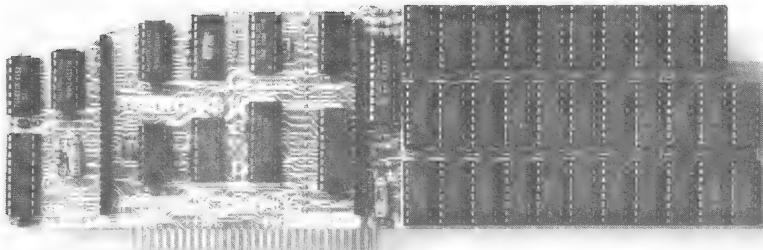
For Postage and Handling, please include \$2.00 if U.S., \$5.00 for all other countries.  
California state residents, please include applicable sales tax.

**QUICK TRACY** requires S-C Macro Assembler version 2.0, DOS 3.3, or ProDOS,  
Apple ][+ or Apple //e, at least 64K of RAM, printer and disk drive.

"Apple" is a registered trademark of Apple Computer, Inc.

# RamWorks III®

*The Best Selling Memory Card for the Apple Just Got Even Better!*



*With battery backed RAM port, RGB port, increased memory capacity, full software compatibility and more compact design, RamWorks III is a generation ahead.*

RamWorks III is the newest 3rd generation RAM card for the Apple IIe. It incorporates all of the technology and improvements that years of experience and over a hundred thousand sales have given us. By selling more memory cards than anyone else and listening to our customers, we were able to design a memory card that has the ultimate in performance, quality, compatibility and ease of use. We call it RamWorks III, you'll call it awesome!

#### **The AppleWorks Amplifier.**

While RamWorks III is recognized by all memory intensive programs, NO other expansion card comes close to offering the multitude of enhancements to AppleWorks that RamWorks III does. Naturally, you'd expect RamWorks III to expand the available desktop, after all Applied Engineering was a year ahead of everyone else *including Apple* in offering more than 55K, and we still provide the largest AppleWorks desktops available. But a larger desktop is just part of the story. Look at all the AppleWorks enhancements that even Apple's own card does not provide and *only* RamWorks III does. With a 256K or larger RamWorks III, *all* of AppleWorks (including printer routines) will automatically load itself into RAM dramatically increasing speed by eliminating the time required to access the program disk drive. Switch from word processing to spreadsheet to database at the speed of light with no wear on disk drives.

*Only* RamWorks eliminates Apple-

Works' internal memory limits, increasing the maximum number of records available from 1,350 to over 25,000. *Only* RamWorks increases the number of lines permitted in the word processing mode from 2,250 to over 15,000. And *only* RamWorks (256K or larger) offers a built-in printer buffer, so you won't have to wait for your printer to stop before returning to AppleWorks. RamWorks even expands the clipboard. And auto segments large files so they can be saved on two or more disks. You can even have Pinpoint, MacroWorks or Jeeves and your favorite spelling checker in RAM for instant response.

RamWorks, *nothing* comes close to enhancing AppleWorks so much.

#### **The Most Friendly, Most Compatible Card Available.**

Using RamWorks III couldn't be easier because it's compatible with more off-the-shelf software than any other RAM card. Popular programs like AppleWorks, Pinpoint, Catalyst, MouseDesk, HowardSoft, FlashCalc, The Spread Sheet, Managing Your Money, SuperCalc 3a, and MagiCalc to name a few (and *all* hardware add on's like ProFile and Sider hard disks). RamWorks is even compatible with software written for Apple cards. But unlike other cards, RamWorks plugs into the IIe auxiliary slot providing our super sharp 80 column text in a completely integrated system while leaving expansion slots 1 through 7 available for other peripheral cards.

RamWorks III is compatible with all

Apple IIe's, enhanced, unenhanced, American or European versions.

#### **Highest Memory Expansion.**

Applied Engineering has always offered the largest memory for the IIe and RamWorks III continues that tradition by expanding to 1 full MEG on the main card using standard RAMs, more than most will ever need (1 meg is about 500 pages of text)...but if you do ever need more than 1 MEG, RamWorks III has the widest selection of expander cards available. Additional 512K, 2 MEG, or 16 MEG cards just snap directly onto RamWorks III by plugging into the industry's only low profile (no slot 1 interference) fully decoded memory expansion connector. You can also choose non-volatile power independent expanders allowing permanent storage for up to 20 years.

#### **It Even Corrects Mistakes.**

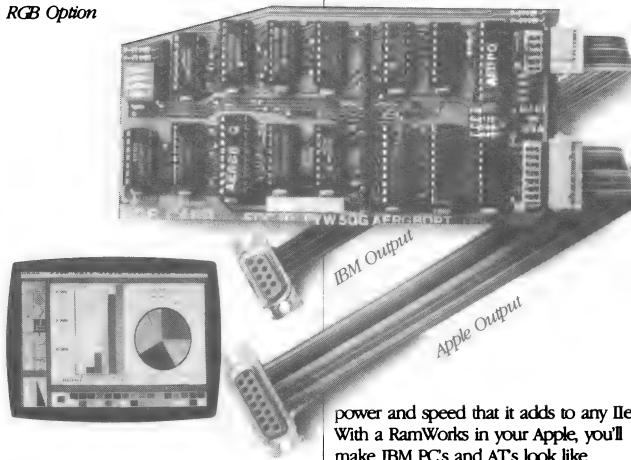
If you've got some other RAM card that's not being recognized by your programs, and you want RamWorks III, you're in luck. Because all you have to do is plug the memory chips from your current card into the expansion sockets on RamWorks to recapture most of your investment!

#### **The Ultimate in RGB Color.**

RGB color is an option on RamWorks and with good reason. Some others combine RGB color output with their memory cards, but that's unfair for those who don't need RGB *and* for those that do. Because if you don't need RGB

Applied Engineering doesn't make you buy it, but if you want RGB output you're in for a nice surprise because the RamWorks RGB option offers better color graphics plus a more readable 80 column text (that blows away any composite color monitor). For only \$129 it can be added to RamWorks giving you a razor sharp, vivid brilliance that most claim is the best they have ever seen. You'll also appreciate the multiple text colors (others only have green) that come standard. But the RamWorks RGB option is more than just the ultimate in color output because unlike others, it's fully compatible with all the Apple standards for RGB output control, making it more compatible with off-the-shelf software. With its FCC certified design, you can use almost any RGB monitor because only the new RamWorks RGB option provides both Apple standard and IBM standard RGB outputs (cables included). The RGB option plugs into the back of RamWorks with no slot 1 interference.

#### *RGB Option*



ference and remember you can order the RGB option with your RamWorks or add it on at a later date.

#### **True 65C816 Bit Power.**

RamWorks III has a built-in 65C816 CPU port for direct connection to our optional 65C816 card. The only one capable of linearly addressing more than 1 meg of memory for power applications like running the Lotus 1-2-3™ compatible program, VIP Professional. Our 65C816 card does not use another slot but replaces the 65C02 yet maintains full 8 bit compatibility.

#### **Endorsed by the Experts.**

A+ magazine said "Applied Engineering's RamWorks is a boon to those who must use large files with AppleWorks...I like the product so much that I am buying one for my own system." inCider magazine said "RamWorks is the most



*Steve Wozniak, the creator of Apple Computer*

*"I wanted a memory card for my Apple that was fast, easy to use, and very compatible; so I bought RamWorks."*

powerful auxiliary slot memory card available for your IIe, and I rate it four stars. For my money, Applied Engineering's RamWorks is king of the hill."

Apple experts everywhere are impressed by RamWorks's expandability, versatility, ease of use, and the sheer

coverage no matter where you purchase

- Built-in super sharp 80 column display, (with or without RGB)
- Expandable to 1 MEG on main card
- Expandable to 16 meg with expander card, with NO slot 1 interference
- Can use 64K or 256K RAMs
- Powerful linear addressing 16 bit coprocessor port
- Automatic AppleWorks expansion up to 3017K desktop
- Accelerates AppleWorks
- Built-in AppleWorks printer buffer
- The only large RAM card that's 100% compatible with all IIe software
- RamDrive™ the ultimate disk emulation software included free
- Memory is easily partitioned allowing many programs to be in memory at once
- Compatible, RGB option featuring ultra high resolution color graphics and multiple text colors, with cables for both Apple and IBM type monitors
- Built-in self diagnostics software
- Lowest power consumption (patent pending)
- Takes only one slot (auxiliary) even when fully expanded
- Socketed and user upgradeable
- Software industry standard
- Advanced Computer Aided Design
- Used by Apple Computer, Steve Wozniak and virtually all software companies
- Displays date and time on the AppleWorks screen with any PRO-DOS compatible clock
- Much, much more!

<b>RamWorks III with 64K</b>	<b>\$179</b>
<b>RamWorks III with 256K</b>	<b>\$219</b>
<b>RamWorks III with 512K</b>	<b>\$269</b>
<b>RamWorks III with 1 MEG</b>	<b>\$369</b>
<b>RamWorks III with 1.5 MEG</b>	<b>\$539</b>
<b>RamWorks III with 2 to 16 MEG</b>	<b>CALL</b>
<b>65C816 16 Bit Card</b>	<b>\$159</b>
<b>RGB Option</b>	<b>\$129</b>
<b>256K Upgrade</b>	<b>\$ 50</b>

power and speed that it adds to any IIe. With a RamWorks in your Apple, you'll make IBM PC's and AT's look like slowpokes.

#### **Quality and Support of the Industry Leader**

RamWorks III is from Applied Engineering, the largest, most well supported manufacturer of Apple peripherals and the inventor of large RAM cards for the Apple. With our 5 year no hassle warranty and outstanding technical support, you're assured of the most trouble free product you can buy.

#### **It's Got It All**

- 15 day money back guarantee
- 5 year hassle free warranty insures

RamWorks III. The industry standard for memory expansion of the Apple IIe. ORDER YOUR RamWorks III TODAY. 9 a.m. to 11 p.m. 7 days, or send check or money order to Applied Engineering. MasterCard, Visa and C.O.D. welcome. Texas residents add 5% sales tax. Add \$10.00 if outside U.S.A.

**AE Applied Engineering™**  
P.O. Box 798, Carrollton, TX 75006  
(214) 241-6060

## An Important Patch for ProDOS S-C Macro Assembler

For over a year now a design error has been lurking inside the ProDOS version of the S-C Macro Assembler. Both the assembler and ProDOS itself make extensive use of the standard system input buffer, \$200-2FF. During assembly, if you try to direct the object code to more than one target file (using the .TF directive more than one time), things did not go well. The DOS 3.3 version had no such problem.

Following is an example of such a source file. If you type it in and try to assemble it with the ProDOS version, the second and third ".OR" lines will not list properly. In fact, if you have a ProDOS-compatible clock installed, you will see the date and time information instead!

```
1000 *SAVE S.TEST.FIXTF
1010 *-----
1020     .OR $300
1030     .TF B1
1040 X    LDA #3
1050 *-----
1060     .OR $310
1070     .TF B2
1080 Y    LDA #3
1090 *-----
1100     .OR $320
1110     .TF B3
1120 Z    LDA #3
1130 *
```

After much thought, the only way I can think of to "fix" it is to save the contents of the buffer each time the assembler issues a ProDOS command, and restore the contents afterward. There just happens to be enough room in a "patch" area between \$BC00 and \$BCFF to do this. The code that needs to be patched may not be in exactly the same location in every copy of the ProDOS version we have sold, so I have written a patching program which will automatically find the exact location and install the patches.

In the following program, a "dummy" section at lines 1800-1940 shows the patched routine. The addresses shown correspond to the latest version. The code shown at \$901F-9034 was originally located three bytes lower, at \$901C-9031. My patcher moves the code three bytes higher, as shown, and inserts the JSR PATCH1 and JMP PATCH2 code. The PATCH code goes into a free space at \$BC00, and the save area is from \$BC80 through \$BCFF. The patches are actually installed on the image of the SCASM.SYSTEM file, as BLOADED into \$2000-\$65FF.

Once you have the patching program typed in, the procedure to install the patches is as shown in the comments at the beginning of the program (lines 1020-1060). Just to be sure you have it all right, don't save the patched version on an important disk! Try it out first on a scratch disk, and if everything still works you can update your master copies.

On the other hand, if the whole process seems to laborious or dangerous, send us the original disk of the ProDOS S-C Macro Assembler and we will update it for you. Or, if we have your

registration on file you may send \$5 and we will send you a fresh disk with the updated version on it.

Many thanks to Richard A. Sims for pointing out this problem to us.

```
1000 *SAVE FIX.TF.9.8.86
1010 -----
1020 * :LOAD FIX.TF.9.8.86
1030 * :ASM
1040 * :BLOAD SCASM.SYSTEM,TSYS,A$2000
1050 * :$800G
1060 * :BSAVE SCASM.SYSTEM,TSYS,A$2000,L$4600
1070 -----
00- 1080 PNTR .EQ $00,01
1090 -----
1100 PATCH.SC
1110 *---COPY PATCH1, PATCH2 TO $5D00 (IMAGE OF $BC00)---
0800- A0 00 1120 LDY #0
0802- B9 6D 08 1130 .1 LDA BC00,Y
0805- 99 00 5D 1140 STA $5D00,Y
0808- C8 1150 INY
0809- C0 1E 1160 CPY #BC00,SZ
080B- 90 F5 1170 BCC .1
1180 *---FIND A2.FF.E8.BD.CE BTWN 2000.65FF-----
080D- A9 00 1190 LDA #$2000
080F- 85 00 1200 STA PNTR
0811- A9 20 1210 LDA /$2000
0813- 85 01 1220 STA PNTR+1
0815- A0 00 1230 .2 LDY #0
0817- B1 00 1240 .3 LDA (PNTR),Y
0819- D9 68 08 1250 CMP STRING,Y
081C- F0 00 1260 BEQ .4 ...MATCHES SO FAR
081E- E6 00 1270 INC PNTR
0820- D0 F3 128C BNE .2
0822- E6 01 1290 INC PNTR+1
0824- A5 01 1300 LDA PNTR+1
0826- C9 66 1310 CMP /$6600
0828- 90 EB 1320 BCC .2
082A- 00 1330 BRK COULD NOT FIND STRING
1340 *** .4
082B- C8 1350 INY
082C- C0 05 1360 CPY #STRING.SZ
082E- 90 E7 1370 BCC .3
1380 *---COPY ADDRESS OF PASS.CMD.TO.PRODOS-----
0830- A0 1A 1390 LDY #$1A
0832- B1 00 1400 LDA (PNTR),Y
0834- 8D 10 5D 1410 STA PATCH2-$BC00+$5D00+4
0837- C8 1420 INY
0838- B1 00 1430 LDA (PNTR),Y
083A- 8D 11 5D 1440 STA PATCH2-$BC00+$5D00+5
1450 *---SHIFT "ISSUE.DOS.COMMAND" 3 BYTES AHEAD-----
083D- A0 15 1460 LDY #$15
083F- B1 00 1470 .5 LDA (PNTR),Y
0841- C8 1480 INY
0842- C8 1490 INY
0843- C8 1500 INY
0844- 91 00 1510 STA (PNTR),Y
0846- 88 1520 DEY
0847- 88 1530 DEY
0848- 88 1540 DEY
0849- 88 1550 DEY
084A- 10 F3 1560 BPL .5
1570 *---BUILD "JSR PATCH1"-----
084C- A0 00 1580 LDY #0
084E- A9 20 1590 LDA #$20
0850- 91 00 1600 STA (PNTR),Y
0852- C8 1610 INY
0853- A9 00 1620 LDA #PATCH1
0855- 91 00 1630 STA (PNTR),Y
0857- C8 1640 INY
0858- A9 BC 1650 LDA /PATCH1
085A- 91 00 1660 STA (PNTR),Y
1670 *---BUILD "JMP PATCH2"-----
085C- A0 1A 1680 LDY #$1A
085B- A9 OC 1690 LDA #PATCH2
0860- 91 00 1700 STA (PNTR),Y
0862- C8 1710 INY
```



### NEW !!! ][ IN A MAC: \$69.00

This Apple II emulator runs DOS 3.3 and PRODOS programs (including 6502 machine language routines) on a 512K Macintosh. All Apple II features are supported such as HI-RES/LO-RES graphics, 40/80 column text screens, language card and joystick. Also included: clock, RAM disk, keyboard buffer, on-screen HELP, access to the desk accessories and support for 4 logical disk drives. Package includes 2 MAC diskettes (PROGRAM holds emulation, communications and utility software, DATA holds DOS 3.3 and PRODOS system masters, including Applesoft and Integer BASIC) and 1 Apple II diskette (transfer software moves disk images to the MAC).

### NEW !!! SCREEN.GEN: \$35.00

Develop HI-RES screens for your Apple II on a Macintosh. Don't be limited by MousePaint or other screen editors. Use MACPAINT (or any other application) on the MAC to create your Apple II screen. Then use SCREEN.GEN to transfer directly from the MAC to the Apple II (with SuperSerial card or equivalent). Package includes Apple II diskette with transfer software plus fully commented SOURCE code.

### NEW !!! MIDI-MAGIC for Apple //c: \$49.00

Compatible with any MIDI equipped music keyboard, synthesizer, organ or piano. Package includes a MIDI-out cable (plugs directly into modem port - no modifications required!) and 6-song demo diskette. Large selection of digitized GRS player-piano music available for 19.00 per diskette (write for catalog). MIDI-MAGIC compatible with Apple II family using Passport MIDI card (or our own input/output card w/drum sync for only \$99.00).

---

### FONT DOWNLOADER & EDITOR: \$39.00

Turn your printer into a custom typesetter. Downloaded characters remain active while printer is powered. Use with any Word Processor program capable of sending ESC and control codes to printer. Switch back and forth easily between standard and custom fonts. Special printer functions (like expanded, compressed etc.) supported. HIRES screen editor lets you create your own characters and special graphics symbols. For Apple II, II+, //e. Specify printer: Apple Dot Matrix, C.Itoh 8510A (Prowriter), Epson FX 80/100, or OkiData 92/93.

\* The Font Downloader & Editor for the Apple Imagewriter Printer. For use with Apple II, II+, //e (with SuperSerial card) and the Apple //c (with builtin serial interface).

\* FONT LIBRARY DISKETTE #1: \$19.00 contains lots of user-contributed fonts for all printers supported by the Font Downloader & Editor. Specify printer with order.

### DISASM 2.2e : \$30.00 (\$50.00 with SOURCE Code)

Use this intelligent disassembler to investigate the inner workings of Apple II machine language programs. DISASM converts machine code into meaningful, symbolic source compatible with S-C, LISA, ToolKit and other assemblers. Handles data tables, displaced object code & even provides label substitution. Address-based triple cross reference generator included. DISASM is an invaluable machine language learning aid to both novice & expert alike. Don Lancaster says DISASM is "absolutely essential" in his ASSEMBLY COOKBOOK.

### The 'PERFORMER' CARD: \$39.00 (\$59.00 with SOURCE Code)

Converts a 'dumb' parallel printer I/F card into a 'smart' one. Command menu eliminates need to remember complicated ESC codes. Features include perforation skip, auto page numbering with date & title. Includes large HIRES graphics & text screen dumps. Specify printer: MX-80 with Graftrax-80, MX-100, MX-80/100 with Graftraxplus, NEC 8092A, C.Itoh 8510 (Prowriter), OkiData 82A/83A with Okigraph & OkiData 92/93.

### 'MIRROR' ROM: \$25.00 (\$45.00 with SOURCE Code)

Communications ROM plugs directly into Novation's Apple-Cat Modem card. Basic modes: Dumb Terminal, Remote Console & Programmable Modem. Features include: selectable pulse or tone dialing, true dialtone detection, audible ring detect, ring-back, printer buffer, 80 col card & shift key mod support.

### RAM/ROM DEVELOPMENT BOARD: \$30.00

Plugs into any Apple slot. Holds one user-supplied 2Kx8 memory chip (6116 type RAM for program development or 2716 EPROM to keep your favorite routines on-line). Maps into \$C000-\$CnFF and \$C800-\$FFF.

### C-PRINT For The APPLE //c: \$69.00

Connect standard parallel printers to an Apple //c. C-PRINT plugs into the standard Apple //c printer serial port and into any printer having a standard 36 pin centronics-type parallel connector. Just plug in and print!

---

Unless otherwise specified, all Apple II diskettes are standard (not copy protected!) 3.3 DOS.

Avoid a \$3.00 handling charge by enclosing full payment with order. VISA/MC and COD phone orders OK.

RAK-WARE 41 Ralph Road W. Orange N J 07052 (201) 325-1885



0863-	A9	BC	1720	LDA /PATCH2
0865-	91	00	1730	STA (PNTR),Y
0867-	60		1740	RTS
			1750	*
0868-	A2	FF E8	1760	STRING .HS A2.FF.E8.BD.CE
086B-	BD	CE	1770	STRING.SZ .EQ #-STRING
05-			1780	*
			1790	.DUMMY
			1800	OR \$901C
			1810	ISSUE.DOS.COMMAND
901C-	20	00	1820	JSR PATCH1
901F-	A2	FF	1830	LDX #-1
9021-	E8		1840	.1 INX
9022-	BD	CE 02	1850	LDA \$2CE,X
9025-	9D	05 02	1860	STA \$205,X
9028-	DO	F7	1870	BNE .1
902A-	AA		1880	TAX
902B-	E8		1890	.2 INX
902C-	C8		1900	INY
902D-	B9	4B 90	1910	LDA \$904B,Y
9030-	9D	FF 01	1920	STA \$1FF,X
9033-	10	F6	1930	BPL .2
9035-	4C	OC BC	1940	JMP PATCH2
			1950	.ED
			1960	*
			1970	BC00 .PH \$BC00
BC00-	A2	00	1980	PATCH1 LDX #0
BC02-	BD	00 02	1990	.1 LDA \$200,X
BC05-	9D	80 BC	2000	STA \$BC80,X
BC08-	E8		2010	INX
BC09-	10	F7	2020	BPL .1
BC0B-	60		2030	RTS
BC0C-	8E	42 BE	2033	PATCH2 STX \$BE42 ALLOW DEFERRED COMMANDS
BC0F-	20	00 00	2040	JSR #-# \$84C2
BC12-	A2	7F	2050	LDX #127
BC14-	BD	80 BC	2060	.3 LDA \$BC80,X
BC17-	9D	00 02	2070	STA \$200,X
BC1A-	CA		2080	DEX
BC1B-	10	F7	2090	BPL .3
BC1D-	60		2100	RTS
			2110	.EP
1E-			2120	BC00.SZ .EQ #-BC00
			2130	*

### Patch Bob's ProDOS Selector for Videx.....Garth O'Donnell

The new ProDOS program selector code published in the July 1986 AAL works very well in most configurations, but not in a slot 3 80-column card such as the Videx card I have. The following modifications allow it to work on an Apple II Plus with a Videx 80-column card:

	Original	Videx Version
1425	LDA #\$99	LDA #\$8C
1640	JSR HOME	LDA #\$8C
1641	-----	JSR COUT
3460	LDA #\$FF	LDA #\$8E
3470	STA INVFLG	JSR COUT
4500	LDA #\$3F	LDA #\$8F
4510	STA INVFLG	JSR COUT

These same changes may work with most other 80-column cards, including the //c and //e. The only place I am sure they do not work is in 40-columns. Perhaps by squeezing the code somewhere, we could find room to test the byte at \$37. If (\$37) is \$C3, then we are most probably in an 80-column mode, and should use the patched version above; if not \$C3, then do it the way Bob originally wrote it.

# 1200 BAUD MODEMS

Coit Valley Computers has two modems for your every need. Both are top quality state-of-the-art 1200/300/110 baud **Hayes™** compatible modems; which means your computer can send & receive data at lightning fast speeds! And automatically switch between 1200 and 300 baud to communicate with slower Apples. Since neither comes with software, we carry Ascil Express ProDOS at a low price of \$89.

**\$169.**

## AVATEX™ 1200 EXTERNAL STAND-ALONE MODEM

- 100% plug in Modem for **Apple IIc** or **Macintosh** with proper cable (see below). **Hayes** compatible.
- Universal modem that only requires modem compatible serial card (or port), & cable, to plug into **Apple IIe**, **Apple II+**, or **IBM** Auto Answer, Auto Dial, Auto Redial, Auto Disconnect
- Full Bell 212A compatibility
- Automatically switches between 300 baud & 1200 baud incoming speeds
- Complete diagnostics & full complement of LEDs (TR, SD, RD, HS, MC, TM, RI)
- DATA/VOICE Button switches from talk to data transmission & back again
- FREE Compuserve offer & free access time. One year warranty.

**\$169.**

- Built-in Super Serial Card equivalent
- 1200/300/110 baud operation and Bell 212A compatibility
- Built-in Speaker & Diagnostics
- Auto Dial, Auto Answer, & Auto Select. Two year warranty.

## CABLES REQUIRED WITH AVATEX MODEMS

Apple IIc - Avatex Cable	.....	\$ 22.
Apple IIe, II+ - Avatex Cable	.....	25.
Macintosh - Avatex Cable	.....	27.
IBM - Avatex Cable	.....	23.

## OTHER APPLE PERIPHERALS

IIe/II+ Serial Modem Card	.....	\$ 99.
RGB Monitor for Apple IIe (+ \$24 cable)	.....	324.
Ascil Express ProDOS	.....	89.
MultiRam RGB cards (facing page)	.....	►►►

**\$209.**

## CERMETEK APPLE-MATE™ 1200 INTERNAL MODEM

- Internal 1200 baud modem for **Apple IIe** or **Apple II+**
- Only one card & takes only one slot w/ no external interface or power supply. **Hayes** compatible.

With prices this low, how can you afford to be without a 1200 baud modem?

Just the savings in connect time, will pay for the difference between a 300 & 1200 baud modem. You can get everything you need from Coit Valley Computers. Shipping on modems \$5-Ground/\$8-Air; monitors \$10. See terms on facing page.

Hayes, Avatex, Apple-Mate respective registered trademarks of Hayes Microcomputer Products, E + E DataComm, Cermetek Micro.

**COIT VALLEY COMPUTERS • 14055 Waterfall Way, Dallas, TX 75240 • (214) 234-5047**

MEGALIC

<b>MultiRam</b>		<b>RGB Card</b>	<b>MultiRam IIe Card</b>	<b>OUR LOWEST PRICE</b>
<b>64k MULTIRAM</b>	169.	129.	256k MULTIRAM CX	189.
<b>128k MULTIRAM</b>	179.	139.	512k MULTIRAM CX	222.
<b>320k MULTIRAM</b>	206.	175.	65C816 CX Kit (\$10 less w/card)	129.
<b>576k MULTIRAM</b>	241.	214.	VIP Professional w/any 65C816	117.
<b>832k MULTIRAM</b>	266.	239.	IIc System Clock (Same as Applied Eng)	66.
<b>1024k MULTIRAM</b>	284.	239.  	C-VUE flat panel IIc display	389.
<b>1344k MULTIRAM</b>	449.	384.	1200 Baud IIc Modem w/cable	189.
<b>1600k MULTIRAM</b>	484.	519.		
<b>1792k MULTIRAM</b>				
<b>65C816 EX Co-Processor Card</b>			157.	
<b>Apple IIe Enhancement Kit</b>			62.	

**Terms:** Add \$4 Ground or \$6 Air shipping & phone # to each U.S. card order (foreign orders/FPO/APO extra). Add 3% for MasterCard/Visa (include #/expir) & P.O.'s. For fast delivery send Cashier's/Certified check, Money Order, C.O.D. (add \$6) & personal checks accepted (allow 16 days). **Tax res**

With Due Timeliness II WO /7-Bam Picc reacertive trademarks of Checkmate Technobion Ancien Engineer.

MCI Mail 2060668 • Telav 650206688 (WII)  
ing. WGE

卷之三

**WHY BUY FROM US RATHER THAN SOME MAIL ORDER HOUSES?** Only we offer an exclusive 15 day MultiRam money back satisfaction guarantee, double software, more support, **FREE AUTOMATIC** software updates, **FREE 64k** with each 256K/12K/768K card. We know the products well, & we have them in stock. **CALL FOR DETAILS, PRICES,** **QUANTITY DISCOUNTS, SCHOOLS & GROUPS WELCOME!**

**COMIT VANITY COMPUTERS** • 14055 Waterfall Way Dallas TX 75240 • (214) 234-5047

## MLI Calls and the Monitor "L" Command.....Bob Sander-Cederlof

The "L" command in Wozniak's monitor is one of the great secrets behind Apple's success. "L" has been the key to unlocking many secret doors, enabling programmers to stand on each other's shoulders in their efforts to write all the wonderful software we now enjoy.

Nevertheless, "L" can be improved. We have published at least once before a way to add the ability to specify starting and ending addresses, rather than just living with the built in 20-lines-at-a-time feature. Now that ProDOS is so prevalent, it would be nice if the "L" command could properly handle MLI calls. The three bytes which follow any "JSR \$BF00" instruction should be dis-assembled as one hex byte and an address.

The following program adds both of these improvements. It sets up the control-Y monitor command, so that you can disassemble a range of memory. The command can be entered in several formats. In the following examples, "^Y" means "control-Y"

```
*2000^Y      disassemble one instruction  
*2000..20FF^Y  disassemble 2000..20FF  
.2300^Y      continue and go thru 2300
```

In the listing which follows, lines 1140-1210 install the control-Y vector, so that that monitor command will call DISASM.BF00.

Lines 1240-1300 move the starting address into PC for the disassembler code, and increment the ending address so it will be easier to check later.

Lines 1320-1400 and 1780-1840 handle normal disassembly, but allow for the option of pausing by pressing any key, or aborting by pressing <RETURN>. If the line disassembled was "JSR \$BF00", then lines 1420-1760 disassemble the MLI call number and the address of the MLI parameter block. For example, a disassembled call may look like this:

```
2000- 20 00 BF  JSR $BF00  
2003- C1 34 20 .DA #$C1,$2034
```

Some of you enterprising people who have the source code to the Rak-Ware DISASM may want to add a feature like this to that product, too.

```
1000 *SAVE S.DISASM.BF00  
1010 *-----  
3A- 1020 PC .EQ $3A,3B  
3C- 1030 A1 .EQ $3C,3D  
3E- 1040 A2 .EQ $3E,3F  
40- 1050 PARMs .EQ $40,41,42  
1060 *-----  
F8D0- 1070 MON.INSTDP .EQ $F8D0  
F948- 1080 MON.PRBLNK .EQ $F948  
F953- 1090 MON.PCADJ .EQ $F953  
FD96- 1100 MON.PRYX2 .EQ $FD96  
FDDA- 1110 MON.PRBYTE .EQ $FDDA  
FDED- 1120 MON.COUT .EQ $FDED  
1130 *
```

0800-	A9	4C	1140	INSTALL.CTRL.Y.VECTOR
0802-	8D	F8	1150	LDA #\$4C      JMP OPCODE
0805-	A9	10	1160	STA \$3F8
0807-	8D	F9	1170	LDA #DISASM.BFOO
080A-	A9	08	1180	STA \$3F9
080C-	8D	FA	1190	LDA /DISASM.BFOO
080F-	60		1200	STA \$3FA
			1210	RTS
			1220	*
0810-	A5	3C	1230	DISASM.BFOO
0812-	85	3A	1240	LDA A1      LOAD STARTING ADDRESS
0814-	A5	3D	1250	STA PC
0816-	85	3B	1260	LDA A1+1
0818-	E6	3E	1270	STA PC+1
081A-	D0	02	1280	INC A2      ADJUST END ADDRESS
081C-	E6	3F	1290	BNE .1
			1300	INC A2+1
			1310	*
081E-	20	B6	1320	.1      JSR PAUSE
0821-	20	94	1330	JSR CHECK.FOR.MLI.CALL
0824-	08		1340	PHP      SAVE ANSWER
0825-	20	D0	1350	JSR MON.INSTDP
0828-	20	53	1360	JSR MON.PCADJ
082B-	85	3A	1370	STA PC
082D-	84	3B	1380	STY PC+1
082F-	28		1390	PLP      WAS IT "JSR \$BF00"?
0830-	D0	55	1400	BNE .2      ...NO
			1410	*
0832-	AA		1420	TAX      DO PARMS LINE
0833-	20	96	1430	JSR MON.PRYX2
0836-	20	48	1440	JSR MON.PRBLNK
0839-	A0	00	1450	LDY #0
083B-	20	A7	1460	JSR MY.PRBYTE
083E-	20	A7	1470	JSR MY.PRBYTE
0841-	20	A7	1480	JSR MY.PRBYTE
0844-	20	48	1490	JSR MON.PRBLNK
0847-	A9	AE	1500	LDA #". "
0849-	20	ED	1510	JSR MON.COUT
084C-	A9	C4	1520	LDA #";"
084E-	20	ED	1530	JSR MON.COUT
0851-	A9	C1	1540	LDA #";"
0853-	20	ED	1550	JSR MON.COUT
0856-	20	48	1560	JSR MON.PRBLNK
0859-	A9	A3	1570	LDA #";"
085B-	20	ED	1580	JSR MON.COUT
085E-	A9	A4	1590	LDA #";"
0860-	20	ED	1600	JSR MON.COUT
0863-	A5	40	1610	LDA PARMS
0865-	20	DA	1620	JSR MON.PRBYTE
0868-	A9	AC	1630	LDA #";"
086A-	20	ED	1640	JSR MON.COUT
086D-	A9	A4	1650	LDA #";"
086F-	20	ED	1660	JSR MON.COUT
0872-	A5	42	1670	LDA PARMS+2
0874-	20	DA	1680	JSR MON.PRBYTE
0877-	A5	41	1690	LDA PARMS+1
0879-	20	DA	1700	JSR MON.PRBYTE
087C-	18		1710	CLC
087D-	A5	3A	1720	LDA PC
087F-	69	03	1730	ADC #3
0881-	85	3A	1740	STA PC
0883-	90	02	1750	BCC .2
0885-	E6	3B	1760	INC PC+1
			1770	*
0887-	85	3C	1780	.2      STA A1      (SET UP FOR ".ENDADDR^Y" CALL)
0889-	C5	3E	1790	CMP A2      CHECK IF FINISHED
088B-	A5	3B	1800	LDA PC+1
088D-	85	3D	1810	STA A1+1
088F-	E5	3F	1820	SBC A2+1
0891-	90	8B	1830	BCC .1
0893-	60		1840	RTS
			1850	*
			1860	CHECK.FOR.MLI.CALL
0894-	A0	00	1870	LDY #0      LOOK AHEAD FOR "JSR \$BF00"
0896-	B1	3A	1880	LDA (PC),Y
0898-	C9	20	1890	CMP #\$20      JSR?
089A-	D0	0A	1900	BNE .1      ...NO
089C-	C8		1910	INY
089D-	B1	3A	1920	LDA (PC),Y
089F-	D0	05	1930	BNE .1      ...NOT JSR \$BF00

08A1-	C8	1940		TNN
08A2-	B1	3A	1950	LDA (PC),Y
08A4-	C9	BF	1960	CMP #\$BF
08A6-	60		1970	RTS
			1980	-----
			1990	MY.PRBYTE
08A7-	B1	3A	2000	LDA (PC),Y
08A9-	99	40	2010	STA PARM\$,Y
08AC-	20	DA	2020	JSR MON.PRBYTE
08AF-	A9	A0	2030	LDA #"
08B1-	20	ED	2040	JSR MON.COUT
08B4-	C8		2050	INY
08B5-	60		2060	RTS
			2070	-----
08B6-	AD	00	CO	PAUSE LDA \$C000
08B9-	10	15		BPL .3
08BB-	8D	10	CO	2100 STA \$C010
08BE-	C9	8D		2110 CMP #\$8D
08CO-	FO	OC		2120 BEQ .4
08C2-	AD	00	CO	2130 .1 LDA \$C000 ...ABORT
08C5-	10	FB		2140 BPL .1
08C7-	8D	10	CO	2150 STA \$C010
08CA-	C9	8D		2160 CMP #\$8D
08CC-	D0	02		2170 BNE .3
08CE-	68			2180 .4 PLA
08CF-	68			2190 PLA
08D0-	60			2200 .3 RTS
			2210 -----	

# RAMWORKS™

## ACCEPT NO SUBSTITUTES.

## BECAUSE THERE AREN'T ANY.

**T**here's only one card like RamWorks. We've got the best hardware design. We supply the best software and we've got the best support from software companies.

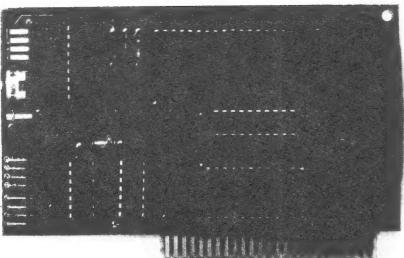
If someone tempts you with an imitation, please get both sides of the story. You'll discover why RamWorks offers the best enhancements to AppleWorks and other programs, and at the lowest price.

**GUARANTEED!**

**214-241-6060  
9 AM - 11 PM**

  
**"We Set the Standard"  
APPLIED ENGINEERING**

# The first clock card to add time and date to AppleWorks' screens and files.



*Timemaster H.O. So many features it's become the world's best selling clock card.*

It's the smart way to put the time and date on your Apple IIe\* or II+\*. Because only the Timemaster H.O. packs *all* the important features of all the competition *combined*, including leap year, year (not just in PRO-DOS), month, date, day of week, hours, minutes, seconds and milliseconds. It's totally PRO-DOS, DOS 3.3, PASCAL, and CP/M compatible. And, of course, it works better than any other clock with AppleWorks.

With the Timemaster H.O., you're assured of reliable, trouble-free operation along with simple, one-command time setting, accuracy through leap years, and a firmware maintained interrupt setting.

If you're using or writing software for other clock cards, you're still covered. Because the H.O. will automatically emulate them. And only the Timemaster H.O. adds 15 new commands to BASIC. The H.O. even comes complete with two disks full of sample programs, including a computerized appointment book, a DOS dating program, interrupt programs, and over 30 programs that others charge you extra for — or don't even offer. As a low-cost option, you can add true BSR remote control to the H.O., giving you remote control of up to 16 lights and appliances in your home or office.

- Time in hours, minutes, seconds and milliseconds; date with year, month, day of week and leap year • 24-hour military format or 12-hour AM/PM format • Eight software controlled interrupts so you can run two programs at the same time (many examples included) • Can be set to the second • Allows AppleWorks to time and date stamp all data automatically • Displays time and date on AppleWorks screens and files • Five-year warranty

Timemaster H.O. \$129.00  
BSR option (may be added later) \$39.00

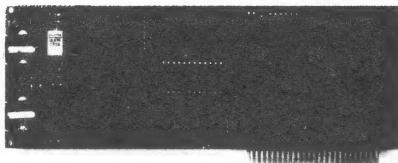
Call to order today, 9 a.m. to 11 p.m. seven days, or send check or money order to Applied Engineering MasterCard, VISA and C.O.D. welcome. Texas residents add 5 1/2% sales tax. Add \$10.00 outside U.S.A.

**AE** Applied Engineering  
*The Apple enhancement experts.*

P.O. Box 798, Carrollton, TX 75006 (214) 241-6060

Viewmaster 80

# Now run AppleWorks™ on your II+ and keep full 80 column compatibility!



	VIEWMASTER 80	SUPERTERM	WIZARD 80	VISION 80	OMNIVISION	VIEWMAX 80	SMARTERM	VIDEOTERM
APPENDIX	-	-	-	-	-	-	-	-
APPENDIX A	-	-	-	-	-	-	-	-
APPENDIX B	-	-	-	-	-	-	-	-
APPENDIX C	-	-	-	-	-	-	-	-
APPENDIX D	-	-	-	-	-	-	-	-
APPENDIX E	-	-	-	-	-	-	-	-
APPENDIX F	-	-	-	-	-	-	-	-
APPENDIX G	-	-	-	-	-	-	-	-
APPENDIX H	-	-	-	-	-	-	-	-
APPENDIX I	-	-	-	-	-	-	-	-
APPENDIX J	-	-	-	-	-	-	-	-
APPENDIX K	-	-	-	-	-	-	-	-
APPENDIX L	-	-	-	-	-	-	-	-
APPENDIX M	-	-	-	-	-	-	-	-
APPENDIX N	-	-	-	-	-	-	-	-
APPENDIX O	-	-	-	-	-	-	-	-
APPENDIX P	-	-	-	-	-	-	-	-
APPENDIX Q	-	-	-	-	-	-	-	-
APPENDIX R	-	-	-	-	-	-	-	-
APPENDIX S	-	-	-	-	-	-	-	-
APPENDIX T	-	-	-	-	-	-	-	-
APPENDIX U	-	-	-	-	-	-	-	-
APPENDIX V	-	-	-	-	-	-	-	-
APPENDIX W	-	-	-	-	-	-	-	-
APPENDIX X	-	-	-	-	-	-	-	-
APPENDIX Y	-	-	-	-	-	-	-	-
APPENDIX Z	-	-	-	-	-	-	-	-

One look at the chart will give you some of the reasons there's only one smart choice in 80 column cards for your Apple. But the real secret to Viewmaster 80's success is something even better: Total compatibility.

Each Viewmaster 80 includes our powerful AppleWorks expand software, allowing AppleWorks to run on the II+ with only 64K (or more) memory. (We recommend the RamFactor memory card, but any compatible Apple memory card will work.) The software provides our full range of AppleWorks enhancements, including expanded records, word processor, multi-disk saving, time and date display on screen with any PRO-DOS clock, and more!

The Viewmaster 80 works with all 80 column applications, including DOS 3.3, PRO-DOS, CP/M, Pascal, WordStar, Format II, Applewriter II, dBase II, Visicalc, Multiplan, and *hundreds* of others — including AppleWorks.

Here are just a few of the powerful features the Viewmaster 80 delivers for a great price (\$139):

- 80 Characters by 24 lines • Fully compatible with all Apple languages and software • Highest compatibility with existing 80 column software • Very low power consumption • High speed (18 MHZ) scroll rate • Upper and lower case characters and true descenders, both inverse and normal; all on-screen editing functions are supported • User-definable cursor shape • Compatible with Apple II, II+ and III • Five-year warranty

Call today to order or for more information, 9 a.m. to 11 p.m. seven days, or send check or money order to Applied Engineering, MasterCard, VISA and C.O.D. welcome. Texas residents add 5 1/2% sales tax. Add \$10.00 outside U.S.A.

**AE** Applied Engineering  
P.O. Box 798, Carrollton, TX 75006  
(214) 241-6060

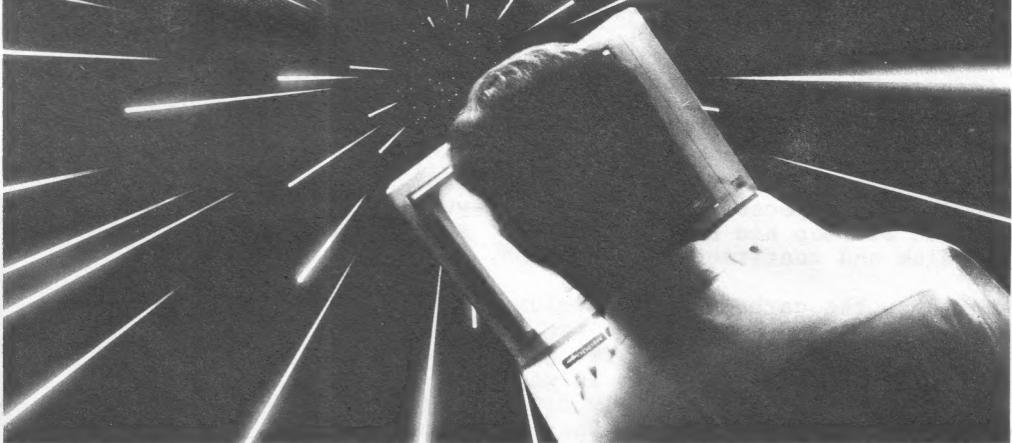
## That Other Integer Square Root.....Bob Sander-Cederlof

As I mentioned last month, just as we were wrapping up the August issue I found a reference to another implementation of the "high school" method of taking square roots. By the time I got it ready there was no room left in that issue, so we postponed it 'til now. Most of the variables are the same as those used in the various routines presented last month.

In the May, 1985 issue of Dr. Dobb's Journal, in the 16-Bit Software Toolbox column, Jim Cathey offered a 68000 16-bit edition of the algorithm. What follows is my 6502 8-bit rendition of his approach.

```
10-      3860 *-----  
11-      3870 ERRHI .EQ 16  
11-      3880 ERRLO .EQ 17  
11-      3890 *-----  
11-      3900 * METHOD DERIVED FROM 68000 CODE IN DDJ MAY 85  
11-      3910 * 6502 VERSION AVERAGES 737 CYCLES  
11-      3920 *-----  
0998- A5 01 3930 SQR3 LDA ARGHI Save working copy of argument  
099A- 85 0E 3940 STA WORKHI  
099C- A5 00 3950 LDA ARGLO  
099E- 85 0F 3960 STA WORKLO  
09A0- A9 00 3970 LDA #0  
09A2- 85 05 3980 STA ROOT Start with ROOT = 0  
09A4- 85 10 3990 STA ERRHI and ERR = 0  
09A6- 85 11 4000 STA ERRLO  
09A8- A0 08 4010 *-----  
09AA- 06 0F 4020 LDY #8 8 pairs of bits in argument  
09AC- 26 0E 4030 .1 ASL WORKLO Two bits out of WORK into ERR  
09AC- 26 0E 4040 ROL WORKHI  
09AE- 26 11 4050 ROL ERRLO  
09B0- 26 10 4060 ROL ERRHI  
09B2- 06 0F 4070 ASL WORKLO  
09B4- 26 0E 4080 ROL WORKHI  
09B6- 26 11 4090 ROL ERRLO  
09B8- 26 10 4100 ROL ERRHI  
09BA- 06 05 4110 ASL ROOT ROOT = ROOT*2  
09BC- A5 05 4120 LDA ROOT BIT = ROOT*2  
09BE- 0A 0A 4130 ASL  
09BF- 85 0B 4140 STA BITLO  
09C1- A9 00 4150 LDA #0  
09C3- 2A 0A 4160 ROL  
09C4- 85 0A 4170 STA BITHI  
09C6- A5 11 4180 LDA ERRLO (CARRY IS CLEAR)  
09C8- E5 0B 4190 SBC BITLO COMPUTE: ERR-BIT-1  
09CA- AA 0A 4200 TAX SAVE LO DIFFERENCE  
09CB- A5 10 4210 LDA ERRHI  
09CD- E5 0A 4220 SBC BITHI  
09CF- 90 06 4230 BCC .2 ERR < BIT  
09D1- 85 10 4240 STA ERRHI  
09D3- 86 11 4250 STX ERRLO  
09D5- E6 05 4260 INC ROOT ROOT = ROOT+1  
09D7- 88 0A 4270 .2 DEY  
09D8- D0 D0 4280 BNE .1  
09DA- 60 00 4290 RTS  
09DB- 00 00 4300 *-----
```

# To boldly go at speeds no Apple has gone before.



*Get TransWarp™. The fastest accelerator you can buy for your Apple™ IIe, II, or II+.*

#### **Computing at warp speed!**

It's an experience you shouldn't miss. And with TransWarp, you won't have to. Because TransWarp will run your software up to 36 times faster\*, leaving other accelerators in the star dust!

No more yawning while your Apple™ slowly rearranges text or calculates spreadsheets. With 256K of ultra-fast RAM, TransWarp speeds up *all* Apple software—including AppleWorks, SuperCalc 3, Visicalc, and all educational software, graphics and games. And it's compatible with all standard peripheral cards (such as RamWorks II and Apple memory cards), printer and sider hard disks, 3½" floppy disks, SCSI-laminated cards, memory clock cards, mouses and more! You name it, TransWarp accelerates it. There's even a 16-bit upgrade chip available should 16-bit software become available for the Apple.



*"I recommend Applied Engineering products wholeheartedly."*

*Steve Jobs, the creator of Apple Computer*

#### **An important difference.**

TransWarp's not the only speedup card on the market. But it's the only one that accelerates your Apple's main memory, ROM and auxiliary memory. And with more and more programs residing in auxiliary memory, buying anyone else's accelerator makes less and less sense. TransWarp even works with most DMA devices including the Swift™ card.

There's one more difference. Since TransWarp doesn't use memory caching, it accelerates *all* software—and not just most of it.

#### **A cinch to use.**

Simply plug TransWarp into any slot in your Apple II, II+ or IIe including slot 3 in the IIe. Instantly you'll be computing at speeds you only dreamed about before. And should you ever wish

to run at normal speed, simply press the ESC key while turning your Apple on.

Since TransWarp is completely transparent, you won't need pre-boot disks or special software. It's ready to go right out of the package!

#### **Speed = Productivity**

Imagine the productivity gains you'll achieve when your programs are running over three times faster. TransWarp is so powerful, your Apple will make IBM PCs™ and even AT's™ look like slowpokes—whether you're planning taxes, plotting charts or playing games! Take a look at a few of the features that set TransWarp apart:

- 3.6 MHz 65C02
- 256K of ultra-fast on-board RAM
- Accelerates main and auxiliary memory
- Low power consumption for cool operation
- Totally transparent operation with all software
- Plugs into any slot, including slot 3 on the Apple IIe
- Accelerated 16 bit option available

#### **Satisfaction guaranteed!**

Give your Apple the TransWarp advantage. With our risk-free 15-day money back guarantee, you have nothing to lose but wasted time. Call today!

TransWarp Accelerator  
16 bit upgrade (may add later)

\$279  
\$89

#### **For fast response:**

Call Applied Engineering, 9 a.m. to 11 p.m., 7 days a week (214) 241-6000. MasterCard, VISA and COD welcome. Texas residents add 5 1/2% sales tax. Add \$10.00 if outside USA.

Or mail check or money order to Applied Engineering, P.O. Box 798, Carrollton, TX 75006.

**AE Applied Engineering**  
*The Apple enhancement experts.*

P.O. Box 798, Carrollton, TX 75006 (214) 241-6060

## Thoughts on the ProDOS Bit Map.....Louis Pitz

I recently learned some more about ProDOS, the hard way. Yes, sometimes catastrophe is indeed the mother of invention, or at least of learning. I was trying to finish typing and saving a program when an electrical storm started. When I did a CATALOG, all the files seemed to be okay, but the footer info at the end about blocks free, used, and total was goofed up. Where I expected 86, 58, and 144, there was instead 681, 64999, and 144.

As an aside, there were only 144 total blocks because the disk is a combination of ProDOS and DOS 3.3, as described in AAL Sep 85 (page 11). But the lesson I learned would apply on regular ProDOS-only disks as well.

Note the logic in the goofed-up numbers:  $681+64999 = 144 \bmod 65536$ . I suspected that, since everything else was okay, the volume bit map had been messed up. So I inspected the blocks on disk and confirmed my suspicion.

Further, the garbage in the volume bit map block was clearly extraneous, and none of the the good data (the first 144/8=18 bytes) had been changed. The garbage was \$DC's in bytes \$14A-1C0, inclusive. This is way past the end of the 'real' bytes even for a ProDOS-only disk (35 bytes). But ProDOS must have counted the 1-bits in the \$DC bytes as free blocks. Then, subtracting this erroneously large number from 144, it got 64999. Yes! \$DC=\$11011100, and there are \$77=119 such bytes, so that is  $5*119=595$  more "free" blocks to add to the 86 really free to get 681.

I've read Sandy Mossberg's article about the ProDOS CAT and CATALOG commands (Nibble, May 86), but the arithmetic counting used sectors must be buried deep in the MLI, associated with the GET-FILE-INFO call, according to my Beneath Apple ProDOS book. Apparently ProDOS must count all the 1-bits in the volume bit map blocks as free, regardless of the number of total blocks on the disk. In a way this seems like,a bug, but I guess it was just a shortcut in coding.

The lesson I have learned is not to use the "unused" part of the volume bit map to store code, messages, or anything. For a ProDOS-only floppy, only 35 bytes are really used, and 477 bytes are wasted. Nevertheless, do not be tempted to use them. They are set to 0 upon formatting the disk, and ProDOS depends upon them staying that way! I've used the extra bytes in the DOS 3.3 VTOC before, but I had better resist this impulse in ProDOS.

Apple Assembly Line (ISSN 0889-4302) is published monthly by S-C SOFTWARE CORPORATION, P.O. Box 280300, Dallas, Texas 75228. Phone (214) 324-2050. Subscription rate is \$18 per year in the USA, sent Bulk Mail; add \$3 for First Class postage in USA, Canada, and Mexico; add \$14 postage for other countries. Back issues are available for \$1.80 each (other countries add \$1 per back issue for postage). A subscription to the newsletter and the Monthly Disk containing all source code is \$64 per year in the US, Canada and Mexico, and \$87 to other countries.

All material herein is copyrighted by S-C SOFTWARE CORPORATION, all rights reserved. (Apple is a registered trademark of Apple Computer, Inc.)